

FORM PTO-1390 (REV. 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				5006602-6	
				U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <b>10/019367</b>	
INTERNATIONAL APPLICATION NO.		INTERNATIONAL FILING DATE		PRIORITY DATE CLAIMED	
PCT/CA00/00520		04/05/2000		06/05/1999	
TITLE OF INVENTION					
LIQUID MIST FIRE EXTINGUISHER					
APPLICANT(S) FOR DO/EO/US					
HOPKINS, Gordon Duane					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
<p>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> has been communicated by the International Bureau.</p> <p style="margin-left: 20px;">c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> is attached hereto.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> have been communicated by the International Bureau.</p> <p style="margin-left: 20px;">c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p style="margin-left: 20px;">d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).</p> <p>9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p><b>Items 11 to 20 below concern document(s) or information included:</b></p> <p>11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input type="checkbox"/> A <b>FIRST</b> preliminary amendment.</p> <p>14. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.</p> <p>15. <input type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input type="checkbox"/> Other items or information:</p>					

U.S. APPLICATION NO. (if known, see 37 CFR 1.57) <b>10/019367</b>		INTERNATIONAL APPLICATION NO. <b>PCT/CA00/00520</b>		ATTORNEY'S DOCKET NUMBER <b>5006602-6</b>	
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21. <input checked="" type="checkbox"/> The following fees are submitted: <b>BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. .... <b>\$1000.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$860.00</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$710.00</b>  International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$690.00</b> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b>  <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>CALCULATIONS PTO USE ONLY</b>          <div style="border: 1px solid black; padding: 2px;">\$ 860.00</div>	
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				<div style="border: 1px solid black; padding: 2px;">\$</div>	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	22 - 20 =	2	x <b>\$18.00</b>	<div style="border: 1px solid black; padding: 2px;">\$ 36.00</div>	
Independent claims	3 - 3 =	0	x <b>\$80.00</b>	<div style="border: 1px solid black; padding: 2px;">\$ -0-</div>	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				<div style="border: 1px solid black; padding: 2px;">\$ -0-</div>	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<div style="border: 1px solid black; padding: 2px;">\$ 896.00</div>	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				<div style="border: 1px solid black; padding: 2px;">\$</div>	
<b>SUBTOTAL =</b>				<div style="border: 1px solid black; padding: 2px;">\$ 448.00</div>	
Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				<div style="border: 1px solid black; padding: 2px;">\$</div>	
<b>TOTAL NATIONAL FEE =</b>				<div style="border: 1px solid black; padding: 2px;">\$ 448.00</div>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +				<div style="border: 1px solid black; padding: 2px;">\$</div>	
<b>TOTAL FEES ENCLOSED =</b>				<div style="border: 1px solid black; padding: 2px;">\$ 448.00</div>	
				Amount to be refunded:	\$
				charged:	\$

a. ☒ A check in the amount of \$ 448.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
 overpayment to Deposit Account No. 500-354. A duplicate copy of this sheet is enclosed.

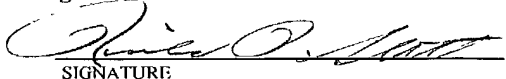
d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card  
 information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR  
 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

Richard P. Stitt  
 Spencer Fane Britt & Browne LLP  
 1000 Walnut St., Ste. 1400  
 Kansas City, MO 64106-2140

  
 SIGNATURE  
 Richard P. Stitt  
 NAME  
35,693  
 REGISTRATION NUMBER

## LIQUID MIST FIRE EXTINGUISHER

### FIELD OF INVENTION

This invention relates to a liquid mist fire extinguisher and more particularly a low pressure water atomizing fire extinguisher.

### BACKGROUND TO THE INVENTION

Fires are classified as A, B, C or D as follows: Class A: ordinary combustibles; Class B: flammable liquids; Class C: electrical fires and Class D: flammable metals. Fire extinguishers are listed in Canada and the United States by ULC and UL respectively according to their effectiveness in suppressing the fires of the various classes. A standard extinguisher with an A:B:C rating for example, is effective in suppressing A, B and C class fires.

To achieve an A:B:C rating, extinguishers to date have used either dry chemicals or halon. The use of dry chemicals results in a messy and sometimes toxic cleanup. Halon is a clean alternative but has been banned by the Montreal Protocol on Substances that Deplete the Ozone Layer.

Water has also been used but prior art water extinguishers have not achieved an A:B:C rating. The standard water extinguisher for example discharges a solid stream of water from a pressurized canister and has a limited Class 2A rating.

Another type of known water extinguisher discharges a spray of water droplets and utilizes the same amount of water as the standard extinguisher. This extinguisher typically operates at about 100 psi. While this water extinguisher has been rated A:C, it does not generate the fine atomized mist required for a class B rating.

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WO 97 02863 to Richter, Joachim discloses a fire extinguisher and a specially designed spray nozzle for producing a jet of extinguishing agent, wherein the extinguisher comprises a pair of containers adapted to store carbon dioxide gas and extinguishing water, whereby upon mixing inside the spray nozzle the carbon dioxide gas causes the water droplets to freeze, allowing for improved throwing ranges.

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water and air are stored together and are released simultaneously and separately to produce a fine liquid mist, capable of class A:B:C rating.

### SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided an apparatus for producing a fine liquid mist, characterized in that the apparatus includes a container for holding a gas and liquid together under pressure, valve means for simultaneously releasing the gas and the liquid separately from the container, a nozzle including a mixing chamber and outlet orifices for emission of the liquid mist, the outlet orifices being at an end of the mixing chamber, feed means for feeding the gas and the liquid separately to the mixing chamber and the mixing chamber having two separate inlets at one end, a first inlet for injection of the liquid radially into the mixing chamber and a second inlet for injection of the gas axially into the mixing chamber for atomization of the liquid.

In another aspect of the present invention, there is provided a release valve for simultaneously releasing a gas and a liquid separately from a pressurized container containing the gas and liquid together and to permit feeding the liquid and the gas as individual, separate fluid streams from the container and to and through the valve, characterized in that the release valve includes a first valve for controlling and regulating the flow of liquid from a container to a first supply means, a second valve for controlling and regulating the flow of gas from the container to a second supply means and a single actuating means connected to a valve member including spaced apart first and second valves for simultaneously actuating the valves.

In a further embodiment of the present invention, there is provided a liquid mist fire extinguisher, characterized in that the extinguisher includes a container for holding a gas and a liquid together under pressure, a valve assembly at an upper end of the container, valve means for simultaneously releasing the gas and the liquid separately from the container, a hose for feeding the gas and the liquid separately

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from the container to a second supply means, and whereby movement of the single actuating means effects opening a closing of the valves to effect control and regulation of flow of the liquid and the gas.

In a further embodiment of the present invention, there is provided a liquid mist fire extinguisher, comprising a container for holding a gas and a liquid under pressure, a valve assembly at an upper end of the container for releasing the gas and the liquid from the container, a hose and a nozzle assembly, characterized in that the extinguisher has a single actuating means for simultaneous release of the liquid and the gas by simultaneously actuating first and second valve means, the actuating means controlling spaced apart first and second valves, and wherein the valve means simultaneously releases the gas and the liquid separately from the container, the first valve means controlling and regulating the flow of liquid from a container and the second valve controlling and regulating the flow of gas from the container.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 is a cross-section of a fire extinguisher according to the present invention;  
Figure 2 is a cross-section of the valve structure at the top of the extinguisher of Figure 1, to a larger scale, and at right angles to that of Figure 1; with valve closed;

Figure 3 is a cross section similar to that of Figure 2, with valve open;

Figure 4 is a cross section of the valve structure, on the axis of the cross section of Figure 1;

Figure 5 is a longitudinal cross section through the nozzle;

Figure 6 is an end view on the end of the nozzle member, in the direction of arrow A.

Figure 7 is a cross-section of another embodiment of the valve structure of the present invention, on the axis of the cross-section Figure 1.

Figure 8 is a cross section of another embodiment of the valve structure of the present invention, on the axis of the cross section of Figure 1.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

The drawings illustrate a fire extinguisher assembly having an A, B and C rating comprising a pressure container 10 of, for example, an approximately 12L capacity having at its upper end a valve structure 12, and flexible hose 14 with a relatively ridged wand portion 16, and a nozzle assembly 18 at the end of the wand 16. The valve structure 12 closes the upper end of the container which, in use contains a liquid, for example, water, at its lower portion 20 and a pressurizing gas, for



be used to provide a connection to a pressure gauge. Considering the valve portion 64, a reduced diameter portion 66 on the valve member 60 connects with the passageway 46 only, in a closed position, as in Figure 2, and connects passageway 46 with port 76, in an open position, as in Figure 3.

The upper end 80 of the valve member 60 extends beyond the plug 44. A lever 82 (see Figure 1) is pivotally mounted on the end of the stem 60 and extends over the outer end 80. A compression spring 81 is mounted on the outer end 80 of the valve member 60 to bias the valve member to a closed position. Pressure by the lever 82 on the outer end 80 of the valve member 60 will open both valves simultaneously. Various seals are provided for the valve member 60. An O-ring 84 is provided between the passage 46 and the upper end surface of the body 30, in the example of the plug 44, to prevent leakage from the top end or upper surface of the body 30. O-rings 86 and 88 are spaced apart to prevent leakage from port 76 to the passage 46 and enlargement 40 in the valve closed position, and to prevent leakage from the port 76 to the enlargement 40 in the valve open position. O-rings 100 and 107 can be provided in a conventional manner, such as to seal threaded connections 32 and the threaded connection between the plug 44 and the upper end of the body 30.

Figure 4 illustrates the attachment of the flexible hose 14 to the valve body 30, with connections to the enlargement 40, and also connection of a flexible tube 110, inside the hose 14 to the passage 46. The hose 14 is connected to the body 30 via a threaded connection 112 in a bore 114 connecting to the enlargement 40. The tube 110 extends up through a bore 116 in the top part of the body 30 to connect to the passage 46. As seen in Figure 1, the tube 110 extends through the hose 14 and wand 16 to a nozzle assembly 18.

When the valves are closed, neither the liquid nor gas can flow from the container 10 to the nozzle assembly 18. Pushing down on the lever 82 opens the valves to a position as seen in Figure 3. Liquid escapes up past the lower end of the valve member 60 into the enlargement 40 and up through bore 114 and connection 112

into the hose 14. Simultaneously, air escapes through bores 70 and 76, recess 66, passage 46 and then through the tube 110 to nozzle 18.

One form of nozzle assembly 18 is illustrated in Figure 5. This assembly has a nozzle member 120 attached to the end of the wand 16 and an internal intermediate support member 122 to which the tube 110 is connected. The member 122 includes an orifice or bore 128 formed internally of the member 122, and can be, e.g., 0.75-1.5 mm in diameter.

The member 122 is connected to the nozzle member 120 forming an axial hollow or mixing chamber 126. A passage 124 provides access, via a port 125, to a mixing chamber 126 for the liquid in the wand 16. Port 125, can be, e.g., 2 - 3.5 mm in diameter. Liquid enters the mixing chamber 126 through the port 125 at right angles to the longitudinal axis of the nozzle 18. Gas flows through bore 128 of the member 122 into the mixing chamber 126 and interreacts with the liquid, for effective atomization of the liquid.

The nozzle member 120 is circular in cross section, and has a closed end with a number of orifices 132. One arrangement is seen in Figure 6. The nozzle member 120, at one end of the nozzle assembly 18 has, when seen in cross section (Figure 5) with respect to the longitudinal axis, an angled face 130, the angle being preferably in the range of 60° to 75°.

The gas enters the mixing chamber in a longitudinal direction and combines with the jet of liquid that is entering the mixing chamber at port 125. Thus, this will produce a gas/liquid mixture. The mixture exits the chamber 126 through the orifices 132, resulting in further expansion and further atomization of the liquid. The orifice pattern 132 combined with the amount of atomization and end face angles produces the described mist pattern.

To charge the container 10, about 6L of liquid, for example water is placed in the

container. The gas, for example air, is fed into the upper part of the container 10 through the wand 16 by removing the nozzle 120 and replacing it with an air valve (not shown). The gas source means is connected to the air valve, the valves are opened and air is fed into the container 10. After pressurization, the nozzle is replaced. Pressurization in this manner minimizes later tampering. As an alternative, the gas is fed through bore 72 by removing plug 78. As a further alternative, a pressure gauge can be permanently mounted at the bore 72, and this can be provided with a T-shaped valved connection having an air valve for connection of a pressurized source of gas. The gas is generally pressurized initially to a maximum pressure of about 175 pounds per square inch.

Figure 7 illustrates an alternate embodiment of the valve structure 12. The central longitudinal extending bore above enlargement 40 is not enlarged, eliminating the need for a plug such as plug 44 (see Figure 4) to close off the bore. The bore 116 extends through the top of the valve body 30. The top of the bore 116 is closed by a plug 31. A second bore 33 serves as a transfer passage in place of the chamber 46 (see Figure 4), and is closed by plug 37. The valve structure 12 is otherwise the same as the previous embodiment including the tube 110 which extends up through bore 116.

Figure 8 illustrates a further alternative embodiment of the valve structure 12. The central longitudinal extending bore above enlargement 40 is not enlarged eliminating the need for a plug such as plug 44 (see Figure 4) to close off the bore. Also eliminated is bore 116 (see Figure 7). A bore 33 serves as a transfer passage in place of the transfer passage or chamber 46 (see Figure 4), and is connected through a connection 112A to a flexible hose 14A. As with previous embodiments of the present invention, when the valves are closed, neither the liquid nor gas can flow from the container 10. In use, with similar components described above, pushing down on a lever opens the valves whereby liquid escapes up past the lower end of the valve member into the enlargement and up through the connection and into the hose. Simultaneously, air escapes through suitable bores or the like,

Although embodiments of the invention have been described above, it is not limited thereto and it will be apparent to those skilled in the art that numerous modifications form part of the present invention insofar as they do not depart from the spirit, nature and scope of the claimed and described invention.

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I CLAIM

1. An apparatus for producing a fine liquid mist, comprising a container (10) for holding a gas and liquid together under pressure, valve means (12) for releasing said gas and said liquid from said container (10); a nozzle (18), feed means (14) operatively connecting said nozzle and said container, and a mixing chamber (126) in the nozzle, said mixing chamber (126) having outlet orifices (132) for emission of said liquid mist, said outlet orifices (132) being at a discharge end of said mixing chamber (126),  
characterized in that

said container having actuation means for simultaneously actuating first and second valve means, said actuation means comprising a single actuation lever for simultaneously opening and closing both of said valve means;

said valve means comprising a first valve (62) for controlling and regulating the flow of liquid from a container (10) to a first supply means (112) and a second valve (64) for controlling and regulating the flow of gas from said container (10) to a second supply means (110); wherein simultaneous release of said liquid and said gas is achieved when said single actuating lever (82) is displaced whereby movement of each of said first and second valves occurs, and wherein

said mixing chamber (126) includes two separate inlets at one end, a first inlet (125) for injection of said liquid radially into the mixing chamber and a second inlet (128) for injection of said gas axially into said mixing chamber (126) for atomization of said liquid.

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2. A release assembly for simultaneously releasing a gas and a liquid separately from a pressurized container containing said gas and liquid together and to permit feeding said liquid and said gas as individual, separate fluid streams from said container and to and through said valve, characterized in that :

the release assembly is a single actuating means (82) connected to a valve member including spaced apart first and second valves for simultaneously actuating said valves,

said first valve (62) for controlling and regulating the flow of liquid from a container (10) to a first supply means (112);

said second valve (64) for controlling and regulating the flow of gas from said container (10) to a second supply means (110) ; and whereby movement of said single actuating means effects simultaneous opening and closing of said valves to effect control and regulation of said simultaneous flow of said liquid and said gas from said valves.

3. A release valve according to claim 2, comprising an elongate valve member (60), and spaced apart valve seats (38, 42), said first valve (62) formed at one end of said valve member (60), said second valve (64) formed at a position intermediate the other end of said valve member (60) and said first valve (62), said means (82) for actuating said valves positioned at the other end of said valve member (60).

4. A release valve according to claim 3, further comprising an enlargement at

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said one end, movable axially to open and close an orifice.

5. A release valve according to claim 4, further comprising a reduced section at said intermediate position of said valve member 60, axially spaced inlets and outlets, said reduced section movable axially to a position connecting said inlet and outlet.
6. A release valve according to claim 5, comprising a valve body (30), said elongate member (60) positioned in a bore in said valve body (30), said orifice formed at one end of said bore, and means (26) for feeding said liquid from said orifice to an outlet in said bore.
7. A release valve according to claim 6, comprising means (70) for feeding gas through said body (30) to a port (76) in said bore and a chamber (46) in said body (30) at the other end of said bore, said reduced section movable to connect and disconnect said port (76) to said chamber (46) and means for feeding said gas from said chamber (46) to said outlet.
8. A release valve according to claim 7, including connection means (112) for connecting a feed means (14) to said outlet and feeding said liquid and said gas separately to said feed means (14).
9. A release valve according to claim 8, comprising means (70) for feeding gas through said body (30) to a port (76) in said bore and a transfer

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passage (46) in said body (30) at a position intermediate the ends of said bore, said reduced section movable to connect and disconnect said port (76) to said transfer passage (46) and means (114) for feeding said gas from said transfer passage (46) to said outlet.

10. A release valve according to claim 9, including connection means (112) for connecting a feed means (14) to said outlet and feeding said liquid and said gas separately to said feed means (14).

11. A liquid mist fire extinguisher, comprising a container (10) for holding a gas and a liquid together under pressure, a valve assembly (12) at an upper end of said container (10) for releasing said gas and said liquid from said container (10), a hose and a nozzle assembly (18) and a mixing chamber (126), characterized in that

the extinguisher has a single actuating means (82) for simultaneous release of said liquid and said gas by simultaneously actuating first and second valve means (62, 64), said actuating means controlling spaced apart first and second valves (62, 64); and

wherein said valve means (62, 64) simultaneously releases said gas and said liquid separately from said container (10), said first valve means (62) controlling and regulating the flow of liquid from a container (10) and said second valve (64) controlling and regulating the flow of gas from said container (10).

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12. A fire extinguisher as claimed in claim 11, including a gas conveying tube (110) within said hose (14) for feeding said gas.
13. A fire extinguisher as claimed in claim 12, said valve means (60) comprising a first valve (62) controlling a liquid outlet from said container (10), a second valve (64) controlling a gas outlet from said container (10), means (14) for feeding said liquid and said gas separately from said valves, and means (82) for actuating said valves simultaneously.
14. A fire extinguisher as claimed in claim 13, said first valve (62) formed at one end of said valve member (60), said second valve (64) formed at a position intermediate at the other end of said valve member (60) and said first valve (62), said means (82) for actuating the said valves simultaneously positioned at the other end of said valve member (60).
15. A fire extinguisher as claimed in claim 14, further comprising an enlargement at said one end, movable axially to open and close an orifice.
16. A fire extinguisher as claimed in claim 15, further comprising a reduced section at said intermediate position, axially spaced inlets and outlets, said reduced section movable axially to a position connecting said inlet and outlet.
17. A fire extinguisher as claimed in claim 16, comprising a valve body (30), an

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elongated member (60) positioned in a bore in said body (30), said orifice formed at one end of said bore, and means (26) for feeding said liquid from said orifice to an outlet in a said bore.

18. A fire extinguisher as claimed in claim 17, comprising means (70) of feeding gas through said body (30) to a port (76) in said bore and a chamber (46) in said body (30) at the outer end of said bore, said reduced section movable to connect and disconnect said port (76) to said chamber (46) and means (70) for feeding said gas from said chamber (46) to said outlet.
19. A fire extinguisher as claimed in claim 18, including connection means (112) for connecting a feed means (14) to said outlet and feeding said liquid and said gas separately to said feed means (14).
20. A fire extinguisher as claimed in claim 17, comprising means (70) of feeding gas through said body (30) to a port (76) in said bore and a transfer passage (46) in said body (30) at a position intermediate the ends of said bore, said reduced section movable to connect and disconnect said port (76) to said transfer passage (46) and means (114) for feeding said gas from said transfer passage (46) to said outlet.
21. A fire extinguisher as claimed in claim 20, including connection means (112) for connecting a feed means (14) to said outlet and feeding said liquid and said gas separately to said feed means (14).

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22. A fire extinguisher according to claim 11, wherein said nozzle assembly (18) includes an angled face (130) at one end.

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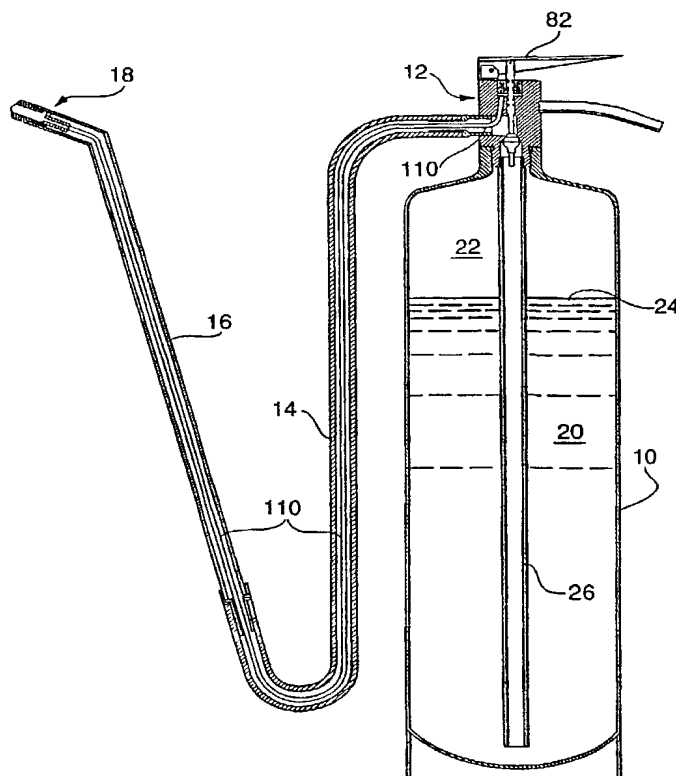
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> A62C 13/64, 31/02, 39/00	<b>A1</b>	<b>(11) International Publication Number:</b> WO 00/67850 <b>(43) International Publication Date:</b> 16 November 2000 (16.11.00)
<b>(21) International Application Number:</b> PCT/CA00/00520 <b>(22) International Filing Date:</b> 4 May 2000 (04.05.00) <b>(30) Priority Data:</b> 09/306,017 6 May 1999 (06.05.99) US <b>(71) Applicant (for all designated States except US):</b> TERRA NOVA MARINE COMPANY LIMITED [CA/CA]; 119 Clyde Avenue, Mount Pearl, Newfoundland & Labrador A1N 4R9 (CA). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> HOPKINS, Gordon, Duane [CA/CA]; Terra Nova Marine Company Limited, 119 Clyde Avenue, Mount Pearl, Newfoundland & Labrador A1N 4R9 (CA). <b>(74) Agents:</b> ZAHL, Adrian et al.; McFadden, Fincham, Suite 606, 225 Metcalfe Street, Ottawa, Ontario K2P 1P9 (CA).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

**(54) Title:** LIQUID MIST FIRE EXTINGUISHER

**(57) Abstract**

A liquid mist fire extinguisher, comprising a container for holding a gas and a liquid under pressure. The extinguisher has valve assembly at the upper end of the container, a valve for simultaneously releasing said gas and said liquid separately from the container, and a hose for feeding said gas and said liquid separately through a nozzle. The nozzle assembly includes means for feeding said gas and said liquid separately through a mixing chamber, and exiting orifices in an end surface of said nozzle assembly for issue of mixed gas and liquid in a fine mist.





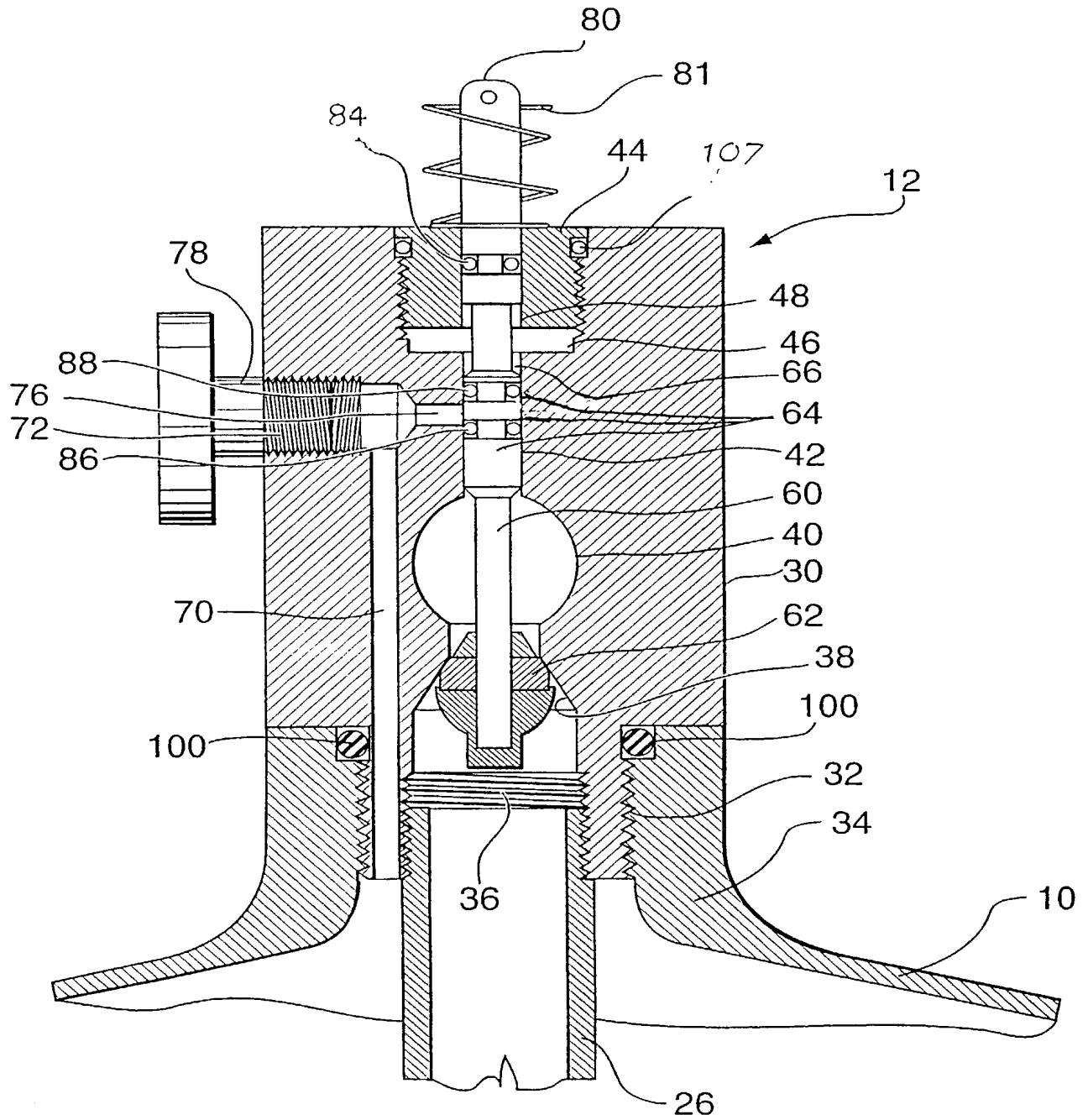


FIG.2

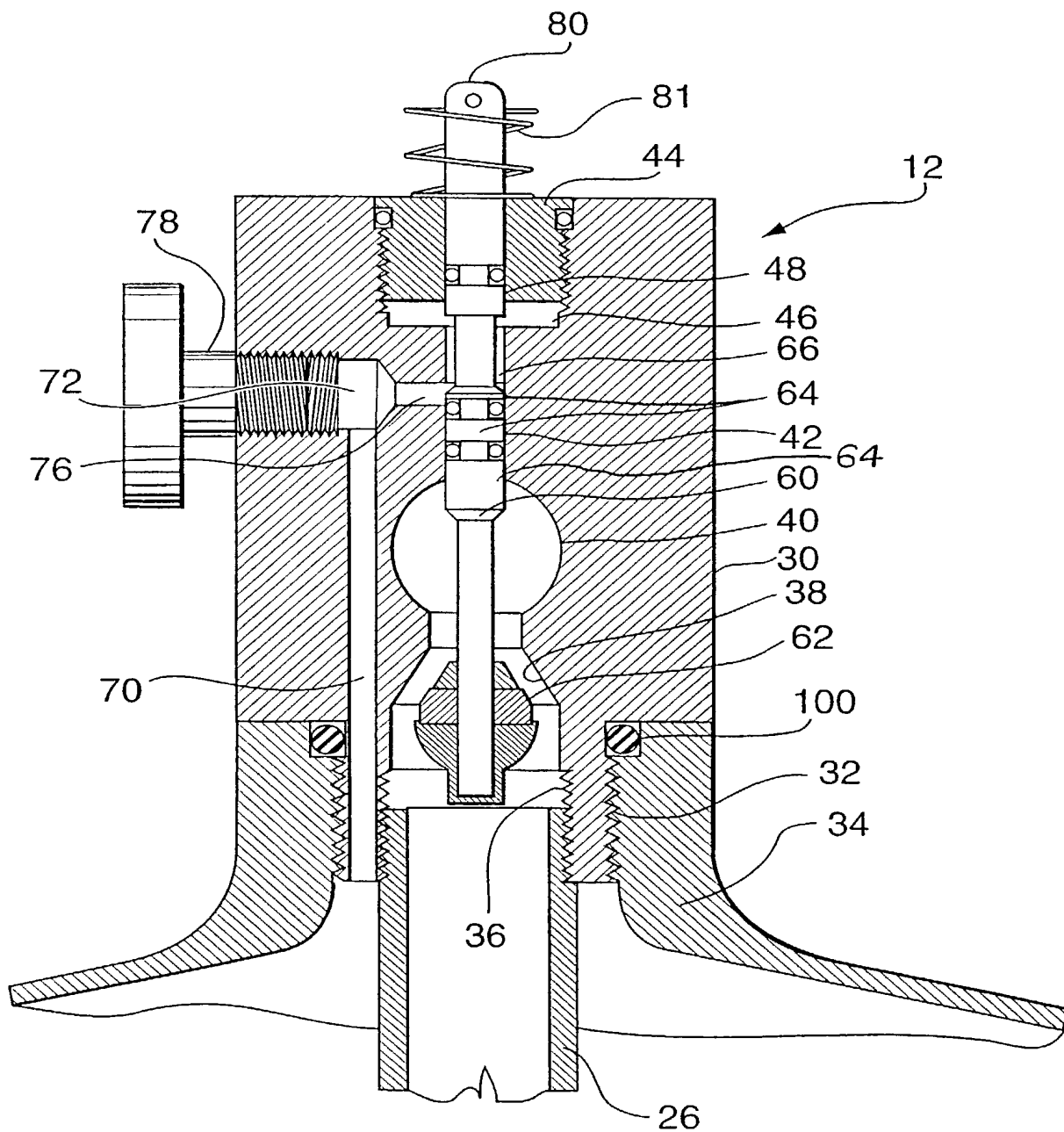


FIG. 3



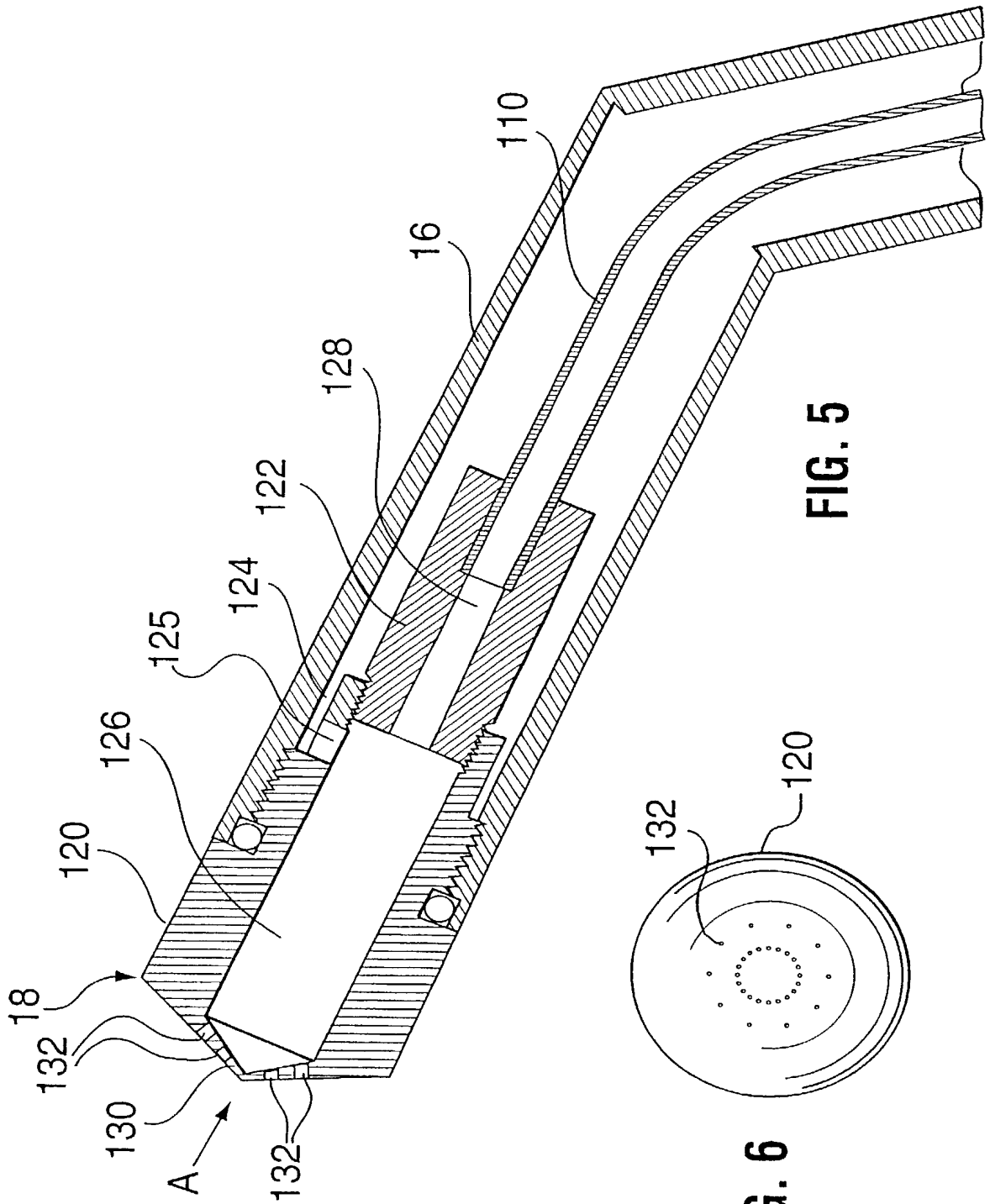


FIG. 5

FIG. 6

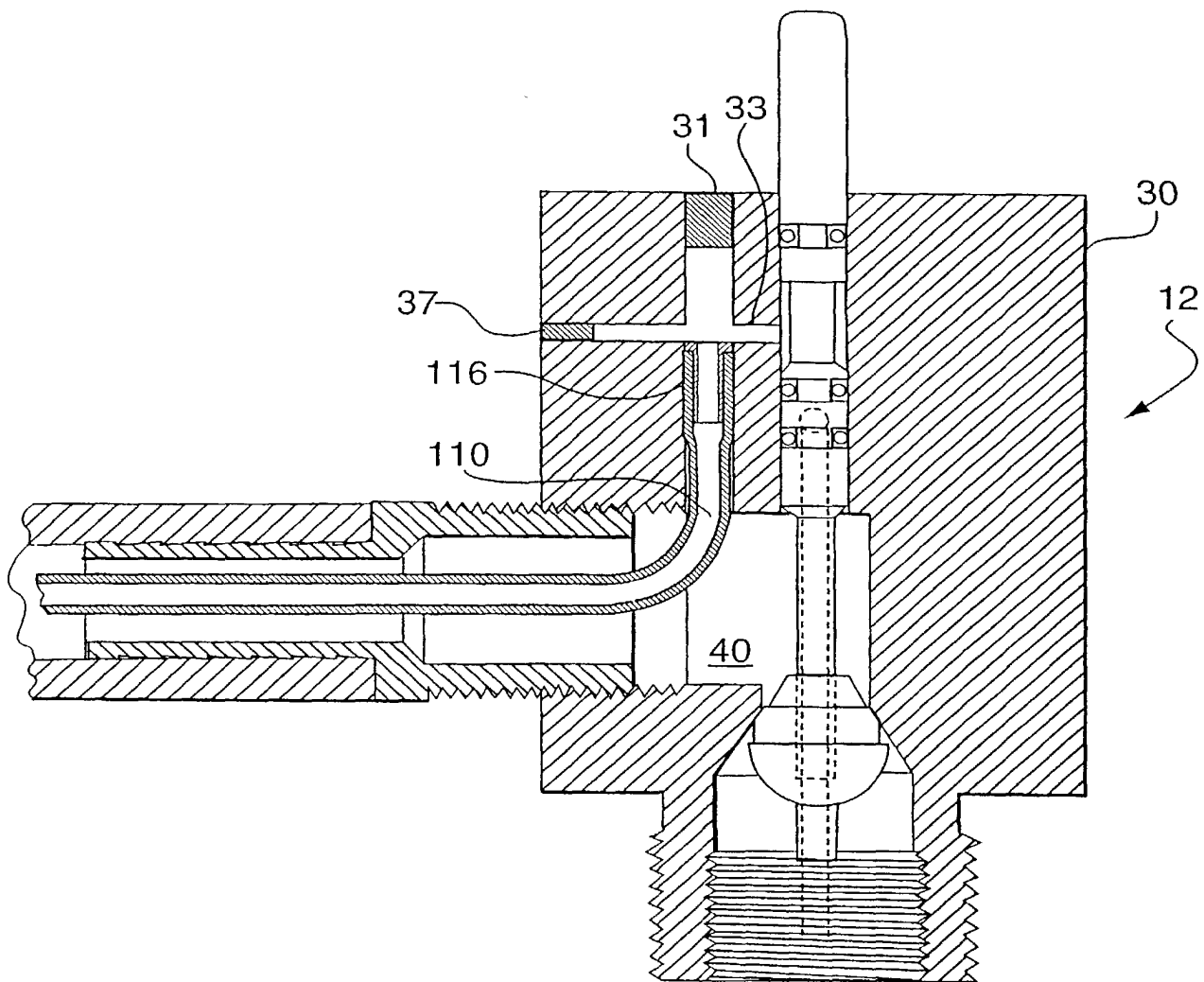


FIG. 7

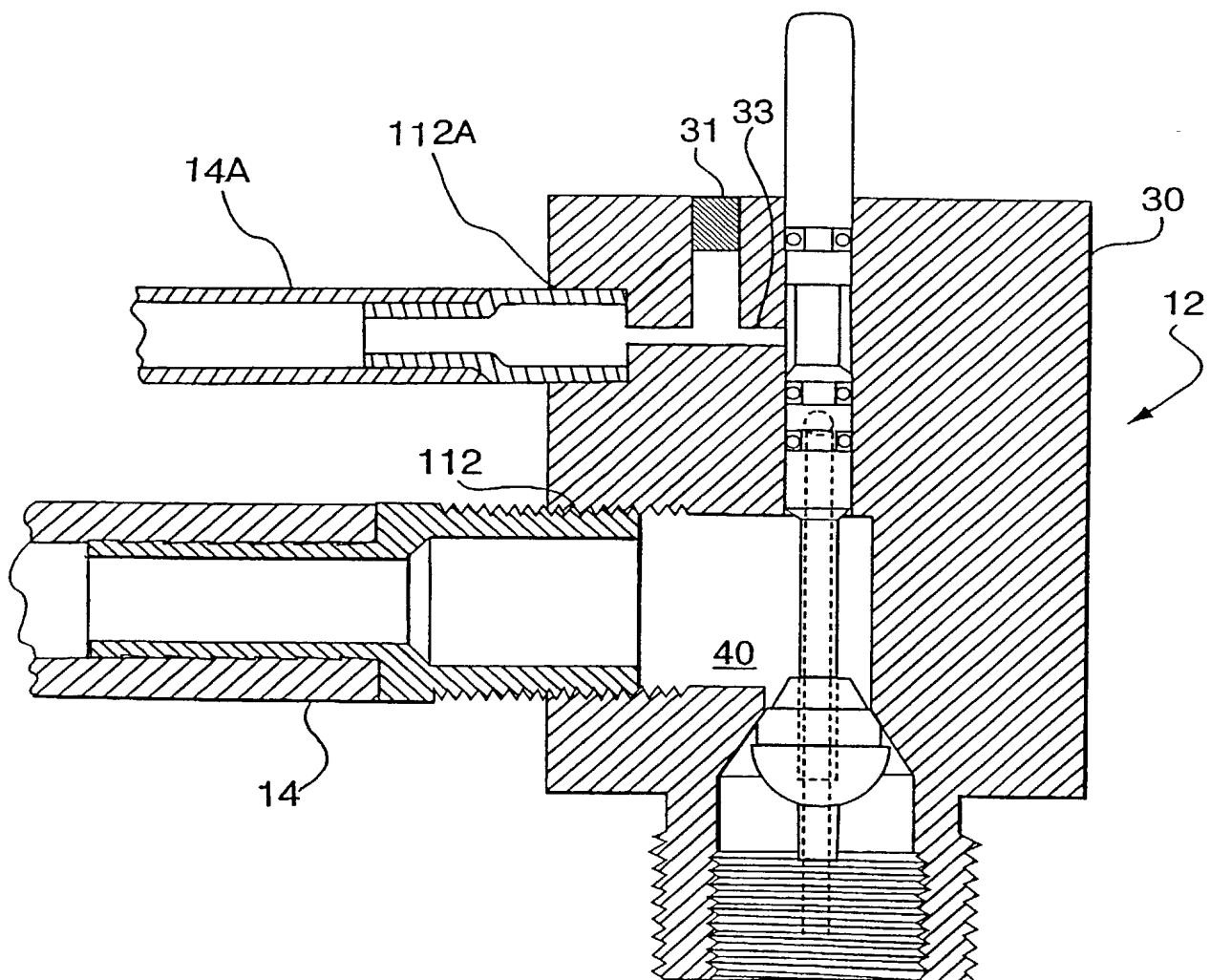


FIG. 8

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NAME OF SOLE OR FIRST INVENTOR :		<input type="checkbox"/> A petition has been filed for this unsigned inventor		
Given Name <u>1-00</u> (first and middle [if any]) <u>Gordon Duane</u>		Family Name or Surname	<u>HOPKINS</u>	
Inventor's Signature 		Date <u>April 16/2002</u>		<u>2002</u>
Residence: City	<u>Mount Pearl</u>	State	<u>NFLD</u>	Country <u>Canada</u> Citizenship <u>Canadian</u> <b>CAX</b>
Mailing Address <u>c/o Terra Nova Marine Company Limited,</u>				
Mailing Address <u>119 Clyde Avenue</u>				
City	<u>Mount Pearl</u>	State	<u>Newfoundland &amp; Labrador</u>	ZIP <u>A1N 4R9</u> Country <u>Canada</u>
NAME OF SECOND INVENTOR:		<input type="checkbox"/> A petition has been filed for this unsigned inventor		
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<b>DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION</b> <b>(37 CFR 1.63)</b>  <input type="checkbox"/> Declaration Submitted with Initial Filing    OR <input checked="" type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16(e)) required)	<b>Attorney Docket Number</b>	5006602-6
	<b>First Named Inventor</b>	HOPKINS, Gordon Duane
	<b>COMPLETE IF KNOWN</b>	
	<b>Application Number</b>	10 / 019,367
	<b>Filing Date</b>	November 11, 2001
	<b>Group Art Unit</b>	
	<b>Examiner Name</b>	

**As a below named inventor, I hereby declare that:**

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**LIQUID MIST FIRE EXTINGUISHER**

the specification of which *(Title of the Invention)*

☐ is attached hereto  
 OR  
☒ was filed on (MM/DD/YYYY) **May 4, 2000** as United States Application Number or PCT International Application Number **PCT/CA00/00520** and was amended on (MM/DD/YYYY) **May 9 & July 30, 2001** (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application	Foreign Filing Date	Priority	Certified Copy Attached? YES      NO
PCT/CA00/00520 09/306,017	WIPO UNITED STATES	05/04/2000 05/06/1999	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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